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The period in this case, as well as in that of γ *Virginis*, was obtained by cutting the ellipse out of card-board, and weighing the different portions of it in a delicate balance. Mr. Bishop, in his invaluable volume of observations, has pointed out how enormously in some instances, the angles obtained by different observers about the same epoch differ from each other. It is, therefore, satisfactory to find recent observations agreeing more closely, as will be seen from the following comparison of observations for 1852:—

			°		″
Fletcher	1852·64	Position	83·97	Distance	1·242
Dawes	1852·73	—	82·52	—	1·567
Miller	1852·77	—	84·07		

Mr. Fletcher's paper concludes with a summary of the results of a series of double-star operations carried on in the years 1851 to 1853 at Whitehaven, by J. F. Miller, Esq., F.R.S. These results all relate to objects included in Mr. Fletcher's catalogue, and they have been obtained by an instrument of the same size as Mr. Fletcher's, though differently mounted. It is also the workmanship of Mr. Cooke.

Micrometrical Measures of ξ Ursæ Majoris, made at the Observatory, Whitehaven. By J. F. Miller, Esq. F.R.S.

Magnitudes, 4½, 5. Both stars white.

No.	Position.	Weight.	Obs.	Distance.	Weight.	Obs.*	Epoch.
	° ′			″			
119	119 36	3	8	2·962	2	8	1853·082
121	118 46	2	8	2·991	4	8	·189
122	118 7	4	8	2·974	4	8	·191
131	118 52	4	8	3·097	4	8	·191
Means	118 47	13	32	3·012	14	32	1853·190
Means	122 17	20	57	2·898	18	52	1852·129

Notes on the Experiences of W. S. Jacob, Esq., H. E. I. Co.'s Astronomer, with the new Madras Equatoreal. By Professor Piazzi Smyth.

Having been favoured in my private correspondence with Mr. Jacob during the last year with many particulars of his observations beyond those contained in his recently communicated paper to the Royal Astronomical Society, and as some of these particulars have a high importance when taken in connexion with the observations of other astronomers, recently published in the *Monthly Notices*, and others again are highly worthy of the at-

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* "The distances represent double measures, consequently each set really consists of sixteen observations."

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tention of good observers during the ensuing season, an mmediate publication appears desirable.

The instrument employed was an equatoreal, recently added to the establishment of the Madras Observatory by the liberality of the Hon. East India Company, and carrying a telescope with a 6-inch object-glass, of 7·5 feet focus; the magnifying power most frequently used was 270, Mr. Jacob always preferring as low as possible compatible with the matter on hand. The polar axis was of the long English form, with the telescope in the middle, on a short double transit-axis; everything being of metal, by MM. Lerebours and Secretan of Paris.

The original order for the instrument was given several years since at a time when it appeared to be thought by the practice of private observers, as well as several public ones, that good telescopes were only procurable at Munich. But in addition to disapproving of the principle of the Munich form of mounting, both Mr. Jacob and myself, to whom he intrusted the order, at that time a private one, had a repugnance to lend any countenance to a monopoly, kept up, generation after generation, not so much by the fair means of superior skill and workmanship as by the unfair means of the conservation of a secret of manipulation. Secrets are radically opposed to the principles of science and the practice of scientific men; and opticians who, in making an object-glass, are profiting by the thousand freely published discoveries of scientific men, are not acting rightly in keeping secret their own single discovery. They even, thereby, retard the improvement of the telescope; for there can be no doubt that were the Munich secret published, it would soon be improved and enhanced by the varied genius and ideas of all other men, just as Daguerre's discovery was so greatly advanced within a few months after its publication, though he had brought it to the ultimate perfection of his own mind, and, as he erroneously thought, the final completion of the thing itself. Even in ordinary trade and manufactures, secretiveness is exploded everywhere, except, perhaps, amongst the most ignorant of uneducated workmen; and a free interchange of ideas as well as commodities is recognised as the surest means of advancement. By no means, then, can concealment be allowed to predominate in the most scientific of all manufactures, and my friend and myself accordingly determined, at least, to try whether a first-rate object-glass could not be procured anywhere else than at Munich.

Attracted to MM. Lerebours and Secretan,* both by much previous fame, as well as by the lowness of their prices, we found all their instrumental work of the first quality; and though the first object-glass failed, the second, which had been tested at the Edin-

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* At the time of the order being given, 1847, it was believed that a sufficiently good telescope could not be made in this country, and that, perhaps, was the reason why the Liverpool observatory was furnished with a Munich object-glass. Now, however, matters are improved, and several makers have distinguished themselves, Mr. Cooke, of York, perhaps chiefly, judging from published observations.

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burgh observatory previously to being sent out to India, has proved equal, if not superior, to anything which could have been expected, from the published performances of telescopes of equal size by other makers.

An approximate trial of the new object-glass was made by Mr. Jacob on its arrival at Madras in August 1852, on several double stars with the following results :—

λ *Ophiuchi* divided by one diameter of B.

τ *Ophiuchi* clearly divided.

Antares, companion immediately discovered ; its previous detection in America not being then known in Madras.

μ *Boötis* elongated.

ζ *Boötis* well divided.

B of γ *Andromedæ*, sufficiently elongated to get a fair measure.

ω *Leonis* elongated.

No great importance is to be attached to these observations, as they were hastily made without waiting for any nights of remarkably good definition ; and I have no recent measures of the objects by other observers to compare them with ; but, on reference to my father's cycle, it will be seen that the object-glass may certainly rank amongst the first, and go forward to a further trial.

Such a one is presented by certain features of the planet *Saturn*, which has been an object of constant observation to some of our best telescopes and most practised observers during the past winter. A planet in general is certainly no accurate test of defining power, unless there be some special test-objects upon it; and the fine division of the outer bright ring of *Saturn* is exactly this species of proof; and as difficult for the telescope as the fine markings on the "navicula" for the achromatic microscope.

Such a fine division has been from time to time suspected by several observers, but was always so faint, and seen through such a small portion of the circumference, and at so very few and such distant intervals of time, that where its existence was believed in at all, it was thought to be temporary, or at all events to vary in width and consequent visibility. If this be true, the same epoch of time must be employed in the comparison of telescopes, and I limit myself, therefore, to the observations of last winter.

The best 6-inch object-glass that Munich has ever produced is probably that in the possession of the Rev. W. R. Dawes, probably also our best observer. By his letters in the *Monthly Notices*, during the last winter, he appears to have had a faint suspicion of traces of the fine division about the ansæ, but has not subsequently insisted upon it. At the same time, Mr. Lassell, with his splendid reflecting telescope, with its mirrors never better, in the clear climate of Malta, and with the planet at a greater height, represents himself as certain that there is no such division. But at the very same time, Mr. Jacob, with *Saturn* certainly a few degrees higher, after very careful adjustment of the focus, immediately saw the fine

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division, and continued to see it during the seven months of the planet's apparition, on every night he looked, except one or two of bad definitions; with powers varying from 170 to 370. It was seen too, moreover, through more than half the circumference of the ring, and with abundant certainty to admit of micrometer measurement.

This certainly appears the most satisfactory account we have ever had of the fine division, especially as the rings are not yet at their maximum inclination; and while it indicates that the notion of the variable breadth of the separation may have been too freely drawn upon, it certainly proves Lerebours' object-glass to give much better definition than Mr. Lassell's speculum, and probably better than Mr. Dawes' Munich object-glass, unless a very wide margin be left for the effect of the different altitudes of the planet at the two places.

Amongst many other features in the appearance of the planet, mentioned by Mr. Jacob, are the transparency of the dark ring, and its brown colour by the transmitted light of the planet, which are both mentioned in a letter, dated Madras, Oct. 10, 1852, and referring to the appearance of the planet on Sept. 22, 1852. He also mentions a suspicion of a sort of scalloping, like the fold of a curtain, on the inner ansæ of the dark ring, and finds the principal division of the bright ring to be filled with a half-luminous medium, and shaded off so much on one edge as to make the accurate measure of its breadth very doubtful.

There can, however, be no doubt of the glasses of the telescope being very transparent, as well as defining well.

Mr. Jacob having lately commenced the regular observation of a selection of double stars, with a view to parallax, though with little hope of success; inasmuch as though this was the final object in view, for which they were taken up by Sir W. Herschel and other observers, no one has yet succeeded in finding the desired quantity. Mr. Jacob was, therefore, unexpectedly pleased at finding, towards the end of last year, that the components of *α Herculis* showed evident symptoms of parallax.

[Professor Smyth then gives the details of Mr. Jacob's observations, which, being similar to those mentioned at page 242, need not be repeated here. He concludes his paper by stating that, as the components of *α Herculis* form one of the most remarkable pairs in the sky for contrasted colours, they may thereby serve to indicate the colour of the medium pervading space.]

On the Corrections to be applied to Burckhardt's and Plana's Parallax of the Moon, expressed in terms of the Mean Arguments. By J. C. Adams, Esq., M.A.

In the Supplement to the *Nautical Almanac for* 1856, I have given new tables of the moon's parallax, adapted to Burckhardt's